average was 492, and the median 50. It is interesting to note that the ratio of the median estimates in the two sets is approximately the same. The number of bills actually required is a little less than seven.

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RECENT PROGRESS IN PETROLOGY.

CHEMICAL CLASSIFICATION OF ERUPTIVE ROCKS.

OSANN, in a recent paper (Tschermak's *Min. u. petrographische Mitth.*, Bd. XX., pp. 399–588, 1901), has carried out with reference to the effusive rocks the principles of classification which in an earlier publication (*Ibid.*, Bd. XIX., pp. 351–470, 1900) he applied to the plutonic rocks. It is his avowed intention to discuss in a third contribution the application of the same principles to the dike rocks.

The chemical compositions of the rocks are expressed by the general formula

$$s_v a_w c_x f\, n_z$$

where

$s =$ the molecule SiO_2.

$a =$ the atomic group $(NaK)_2Al_2O_4$.

$c =$ the atomic group $CaAl_2O_4$.

$f =$ the atomic group $(FeMnMgSrBaCa)O$.

$n =$ the proportion of soda molecules when the relative numbers of soda and potash molecules in the rock are calculated to a sum of 10.

$v =$ the number of molecules of silica when the ordinary molecular ratios of the rock analysis are calculated to a sum of 100.

w, x and $y =$ the proportions of each of their respective atomic groups, when all three are calculated to a sum of 20.

$z =$ the numerical value of the soda proportion n.

In these two papers 207 analyses of plutonic and 403 analyses of effusive rocks are considered and the corresponding rock formulas calculated. From these formulas the rocks are plotted upon triangular projection paper, the elements of the projection being a, c and f.

The carrying out of this plan has involved much labor, and if the result is somewhat disappointing it has at least the full value of recording a careful and sustained experiment. It is to be regretted that the author has modestly restricted his attempt at classification to setting up types within the groups and families of the Rosenbusch classification. It is partly owing to this acceptance of a scheme which has grave objections and which is based on principles little in common with those on trial in this essay, that the latter falls short of more conclusive results. For example, it is seen that the formula of the 'Klausen type' of the diorites is identical with that of a granite intermediate between the 'Syene type' and 'Kamm type,' and similar cases are found among the formulas of the basaltic andesitic and allied rocks of the effusives.

Inspection of the diagrams fails to show any grouping of the effusive rocks upon which classification might be based. In the plutonic rocks the anorthosites alone show some tendency in the graphic projection to form a distinct family. The silica does not appear in the method of plotting here used, and the result is hardly so graphic and satisfactory as that employed by Brogger in his 'Ganggefolge des Laurdalits.'

GNEISSES OF THE SCHWARZWALD.

IN continuation of his studies of the crystalline metamorphic rocks of Baden, Rosenbusch (*Mitth. der Grossh. Badischen Geologischen Landesanstalt*, IV., pp. 367–395, 1901) gives detailed petrographical descriptions and chemical analyses of the para-augite and para-amphibole gneisses of the Schwarzwald, the prefix *para* signifying their derivation from former sediments. The augitic gneisses range from quartzose or psamitic types, to those free from quartz. It is concluded on chemical grounds, supported by geological relationships, that these gneisses have been formed by the metamorphism of calcareous sandstones, dolomitic calcareous shales and clayey marls. The hornblendic gneisses were derived from a ferruginous dolomitic marl containing quartz and rutile.

These interesting studies, which recall those

of Adams on the Grenville Series of Canada, constitute a substantial step toward a more precise knowledge of the real nature and origin of the Archæan complex. The need of modern analyses of typical unaltered sediments for purposes of comparison with crystalline metamorphic rocks in these and similar investigations is rendered apparent.

SEQUENCE OF VOLCANIC ROCKS.

In a paper by Lawson and Palache on the Berkeley Hills, California (*Bull. of the Dept. of Geology,* Univ. of Calif., Vol. 2, pp. 349–450, 1902), the microscopical petrography of a series of andesitic, basaltic and rhyolitic lavas is described in detail. The most interesting petrological feature brought out in their description, however, is the remarkable fivefold repetition of the eruption of andesite, basalt and rhyolite, in the order named. As the authors cautiously point out, the small size of the area considered (less than six square miles) renders it possible that the perfection of this periodicity is accidental, but this commendable reserve does not deprive the fact of its importance and significance. The paper, as a whole, is a successful attempt to present to students a detail of the remarkably rich geological field which surrounds the University of California.

F. L. RANSOME.

THE ALASKA FUEL SUPPLY.

In closing his discussion of the coal resources of Alaska, in Part III. of the Twenty-second Annual Report of the United States Geological Survey, now in press, Mr. Alfred H. Brooks adds some brief comments on the other sources of fuel. In addition to coal, he says, there are three possible sources of fuel supply in Alaska, namely, timber, petroleum, and peat; and of these, timber alone has been utilized. Southeastern Alaska is heavily forested and affords ample wood for fuel. Certain species of trees are found as far west as Kadiak Island. Beyond Kadiak, to the west and north, the coast-region of Alaska is practically treeless. Some willows, and occasionally spruce, are found in the sheltered regions; but for the most part the coastal belt is covered simply with moss, grass and low shrubs. This type of vegetation extends northward to Point Barrow and thence eastward. The moss and grass-covered plains and the rolling plains are called *tundras,* and are found on the northern continental margins encircling the globe.

The interior of Alaska has usually a sufficient supply of wood for ordinary purposes of building and mining and for fuel. The larger river valleys are often heavily forested with spruce and other trees. On the Yukon, near the international boundary, the timber line is at about 3,000 feet; northward it decreases in elevation, and on the Koyukuk it is about 2,500 feet. Still further to the north and west it further decreases in altitude, and on the Upper Kobuk the timber is said to be limited to the floor of the largest river valleys. In the northern Arctic drainage reports state that there is no timber except the willows, which however grow to considerable size. The Kuskokwim, Sushitna and Copper rivers all have timber basins. During the great influx of population of the last three years, much timber has been destroyed by fire in the dry summer months. In the northwestern and northern parts of the territory, from Norton Bay around to the mouth of the McKenzie, the shore was once abundantly supplied with driftwood. The Eskimos, who have been using this wood for generations, are very economical in the matter of fuel, and, until the coming of the white man, the probabilities are that the driftwood was accumulated faster than it was used. This driftwood is brought down from the interior by the larger rivers, whose banks are wooded. The cutting of the wood along the banks of the Yukon has already decreased the annual contribution of driftwood to northern Bering Sea. This, together with the rapid exhaustion by the white man of the supply which had accumulated in the past, will soon cause the Eskimo as well as the white man to be dependent on other sources for fuel. The North Arctic Coast eastward from Point Barrow, which is but thinly populated by natives and seldom visited by whites, has some driftwood. The possibilities of using for fuel the thick growth of vegetable matter which covers most of the